

Reasons for Cooperative Structure

Inger Bierschenk
Bernhard Bierschenk



Lund University
Sweden

KOGNITIONSVETENSKAPLIG
FORSKNING

Cognitive Science Research

Reasons for Cooperative Structure

Inger Bierschenk
Bernhard Bierschenk

1984 No. 7

Communications should be sent to:
Cognitive Science Research
Lund University
S-223 50 Lund
Sweden

Coordinator: Bernhard Bierschenk
Department of Psychology

Abstract

Both ecological and conceptual environments require a ground for their observation. The ground structures an observer's perception of objects and events. It is therefore of high experimental importance that subjects are given the opportunity to verbalize freely how they perceive an environment and orient themselves in it, since in their language there will be expressed towards what kind of ground structure they operate in the perception process.

The experiment described in this article has been based on the linguistic definition of the Ground component. It has been shown that subjects' cooperative structuring of an environment differs on the basis of expressed grounds and that this difference can be interpreted with reference to personal interests.

The Givens

For many years, social and behavioural science research has been concentrated on mapping the mechanisms of individual - environment interactions. These efforts have in particular been aimed at finding out which rule systems are governing the behaviours of single individuals as well as of entire populations. The central ideas of this research have been oriented towards attributive propositions and have been operationalized into models whose expressions may be simple paradigms or complex systems. A model of this kind prerrequires a description of an individual, a behaviour, and an environment with reference in basic elements or building blocks.

The realization of a pattern of behaviour or interaction, for example, requires the construction of the kind of rule system that is based on laws of association. The search for such rule systems has been centred around a few observation techniques intended to register the behaviours in a labyrinth, in decision making of the puzzle type, or in multiple choice tasks. The data that can be registered by these techniques are bound to a processing by rules for summative combinations of simple, discrete, and mutually independent observations. By that, the observed knowledge of the world would be described in mathematical-logical statements about associations between single variables.

Within this approach, it is understood that the basic premise for communicating a theory is that all existing conditions shall be given together with their consequences. In principle, a complete list would be disposed containing all possible questions about the environment, the behaviour, and the individual at the same time as a description would be given of the answers to each single question. A description of an environment may, for example, be given through a list which registers the features of its substance and surface. This kind of environment may be a steep slope in the country. For the characterization of something steep, there has to be a surface over which an individual can walk, run, etc. Moreover, there has to be a brink from which an individual can

fall down. These conditions specify the texture of the environment. The texture can be decomposed as regards, for instance, its consistency, geometrical form, colour, and difference of altitude and be made the subject of a formal definition, as has been shown by Becker (1973).

Now we have become more aware that the standardization of the methods demands the kind of knowledge of the environment, the behaviour strategies, and the individuals that lies beyond the frame of this research approach. Thus the question that immediately presents itself is: To what extent is a method built on de- and re-compositions capable of describing in a realistic way how an organism behaves in relation to its environment? It is hardly possible to give an answer to this question unless it is clear what in the environment the individual shall respond to. Clearly, the physical variables underlie the fact that a cliff is some discontinuity in the ground. If, in addition, a cliff is immediately perceived as something from which an organism may fall, this implies danger, which calls for a re-orientation strategy. Thus danger means a specification of the observer.

The Observer - Event Binding

When that which is given to an observer is perceived to have such qualities that it gives the meaning of fear, for example, an asymmetrical relation may be said to exist between the observer and the given. In a perspective of evolution, this relation is not infrequently described in terms of individual - environment cooperations, where environment stands for social (cultural) setting. In the present context, the given refers to both that which is ecologically given and that which with reference to an observer is conceptually given. In this lies a paradigmatic relationship which binds the observer to operate towards the given, that is, to become an agent (A) in relation to some objective (O). The AaO paradigm, as earlier developed (Bierschenk & Bierschenk, 1976; B. Bierschenk, 1984; I. Bierschenk, 1984a), represents, in a perspective of knowledge development, the binding between the observ-

er and the events, i.e. something significantly distinguished from the observer. Of essential importance is the assumption of the model that the given is the kind of objective that supports a figuration. In this sense the given is "the ground", as proposed in I. Bierschenk (1984b). This makes the given independent of being classified into properties or other terms of quality tied to an organism or an environment. The given exists as an offer, free from values and emotions. Further, it acts immediately upon the observer when entering into function, and this immediateness gets its value (meaning) with specification to the agent. The kind of operations taken by someone posited on the edge of a cliff have different significance for survival depending on who this observer is.

Of vital importance for the organism is to be able to discern points in its environment that can be used for orientation. The single properties of such points of orientation and their relations to each other together make up the texture of the environment. Thus it is not reasonable to assume one point of orientation to be enough. It is the texture as a whole that is the basis for making experiences. One could say that the environmental texture contains structure, which makes possible that the textural experience made can be maintained by the organism and be utilized in an adequate way in novel environments.

To be texturally discernable, a surface must have "life". One phenomenon in our environment being problematic from this point of view is glass. Quite a few of us have probably experienced how small birds fly right into the windows in the summer, especially when plants or other objects in the room are reflected in the glass. Sometimes we seem to have difficulties ourselves in detecting the polished glass doors of modern buildings. In particular when familiar details become salient behind the glass, the environment does not call for our re-orientation. What we and the birds cannot easily cope with is the distinction between an illusory and a real texture. Instead, the glass surface leads us to a direct perception of the texture. The well-known Visual Cliff ex-

periments (Gibson & Walk, 1960), for example, illustrate how the detection of the structure (represented by the infants) in the texture (the cliff) becomes expressed through fearful behaviour.

Expression of Orientation in Language

The given presents itself for acceptance or rejection. The observer orients himself in the given. This means that the fundamental property of an observation is to represent this orientation, which always comprises a ground whether it is stated or not. We concentrate here on the explicit expression of observations, that is, the way they are stated verbally, where the orientation is denoted with linguistic keys. It will be evident that these keys, the prepositions, are immediate when the ground for an orienting operation is to be stated.

An experimental environment. The experimental question in the Visual Cliff studies (Gibson & Walk, 1960) concerns whether a structure can be made so real that it can be utilized for studying perceptual development in infants of crawling age. For this purpose, an environment was constructed whose texture would offer the sense of danger by containing an illusory structure of depth. The confirmation of the presence of this structure was given in the infants' expressions of fear. The environment given for the infants' orientation is a squared ground whose surface is of glass. Half the ground has a texture through a patterned material attached directly beneath the glass. On the other half the texture is deeper down under the glass. The infants orientate on the shallow surface by feeling with different parts of their body that the surface is solid and by seeing the texture in close connection with the tactile impression. They crawl freely over the shallow side as if the given belonged to their world of experience.

Between the shallow and the deep parts of the ground is a particular point of orientation in the form of an elevated brink towards which the infants can orient themselves to explore what might be found behind it. The depth offers different operative behaviours depending on which crawling experience the infants have. Some of

them would cross the surface with different strategies, others would turn away from the unknown, but might very well move the body out over the edge once they have shifted their point of orientation to the familiar basis. Quite a few would orient themselves with their sight down towards the texture and react with anxiety when the structure becomes real for them. The infant's mother is used in the experiments as a lure in order to get the infant to move directedly. Her influence is considerable, which is seen in the strategies used by her child to come nearer to her in a dangerous environment.

Identification of Grounds

The operating strategies in the cliff ground offered may all have their grounds linguistically expressed. The Ground component represents that which is given for a certain operation. In principle, this concerns a spatial orientation which includes a reciprocal relation between a point of observation and a point of orientation.

The infant sits on the cliff (1)
Ground

It crawls over the glass surface in trying to get (2)
Ground
to the mother
Ground

Many infants turned away from their mother when she (3)
Ground
called from the deep side
Ground

Example (1) states the ground as both a surface which supplies the sitting and a point of orientation. Example (2) has two observations stating two orientations. One is a solid surface on which a locomotion takes place, and the other is a specified point towards which the locomotion is directed. The mother is here a point of

orientation to reach, while in the first observation of example (3) she is a point from which to de-orientate. The second observation gives the reason for this re-orientation strategy.

With the assumption that a ground always exists for the observer follows that no operation may be observed independently of its ground. A ground which is not stated, therefore, is considered to be previously introduced. Fundamental to a linguistic analysis based on the AaO paradigm, however, is the specification of the O-component in each observation, the reason why a supplementation of the ground has sometimes to be made:

Others cried (towards the mother) (4)
Ground

This observation follows example (3) above. What has to be supplemented in is the point of orientation towards which this agent was directing itself last, and also preceeded by an appropriate preposition. The links of the AaO paradigm represent transitivity (I. Bierschenk, 1984a). Thus the grammatical notion intransitive verb has no function in a realistically oriented model of analysis.

Finally, the way in which a given ground maintains its conceptual significance without being stated will be illustrated.

Several backed out over to the deep half (5)
Ground

Two keys denote that two grounds exist of which one (edge, brink, cliff) is understood and conceptually necessary. The key is there to mark the sequential binding of this ground to the more specific one of them, which is at the very end of the sequence and therefore becomes focussed upon. The example shows the two-dimensional nature of this component, something which is even more evident from the following example:

He refuses to cross over to the mother
Ground

(6)

The first key marks the distance in the form of a barrier (the deep side) which is intimately connected with the specific point of orientation. The presence of the two dimensions, substance and directionality, in the Ground component means that the choice of which dimension to express is dependent on the perspective structure. The examples (5) and (6) show that one dimension is enough, so the dependent dimension is not supplemented in.

Basic to the use of the AaO paradigm in linguistic analyses is that each of the components is realized only once pro observation, connectivity excepted. There is no connectivity in these examples. This would have required the recurrent presence of one of the prepositions.

Experiment

Method

The essential ambition of experiments aiming at studying natural phenomena should be the ability to offer an environment as natural as possible. An environment suitable for human observers as subjects will have to be designed so that it can constitute just the particular support for the individual's operations that is needed in order to make conclusions possible about the cooperations assumed to be basic to a meaningful behaviour.

As has been said in our introductory remarks, something meaningful does not emerge from the single properties alone. It is rather the constellation given that either works immediately or not at all. It seems to be possible to show the existence of so called perceptual syndroms concerning which objectives and their relations are being perceived in an environment (Bierschenk & Bierschenk, 1984a). Since that which becomes figured out from an environment is controlled or governed by grounds (I. Bierschenk, 1984b), it is of essential interest to study whether it is possible to construct an environment which can form the ground for a cooperative struc-

turing. The experiment concerns a pictorial presentation of the Visual Cliff environment, which has been described above. It is a series of four pictures (Gibson & Walk, 1960, p 65).

The experimental hypothesis is that it can be shown that this environment contains the kind of grounds that motivate for cooperative structuring and that this is reflected in the language of an observer.

Subjects. Sixteen parents were asked to describe the picture series at the time when they were booked for a regular control of their eight to nine months old children at a rural district's child care centre.

Material. The material was offered as a natural part in an information meeting concerning child accidents. The task to describe the pictures was given orally to the subjects. They were asked to conceive of the pictures as a conceptual whole. It was a written task. The kind of texts produced may be illustrated with the following one:

A curious child on expedition. The child reacts to the danger by feeling its way (over the table top). The child seems to hesitate whether it shall go on towards the mother or not.

Results

It is hypothesized that the structure lying in the texture of the Visual Cliff environment is mediated by the language of the subjects to the extent that it has been perceived. Thus their perspective is in the textual flow. A prerequisite for making some synthesis out of a flow is that the analysis is inductive.

The AaO model aims at synthesis (B.Bierschenk, 1984; I. Bierschenk, 1984a) and its operationalization in this analysis would have the following implications. The perspective structure is controlled by the Agent component and the environmental structure by the Objective component. The only way an observer has to express his perspective is to name it by the agent (action centre, source) of his observation. Thus his own perceptions get their expression

in his language. The environment, as he perceives it, is then represented by the linguistic Ground component specifying the perceived for each agent.

For a computation, this means that the agents of the observations can be treated as measuring objects in a matrix and the grounds as the variables. The inductive method used for the linkage of the measuring objects is the cluster analysis. To reduce the matrices, the subjects have been divided into four groups on the basis of their stated interests, namely (1) practical, (2) aesthetic-moral, (3) social, and (4) technical-physical. These have been used in the interpretation.

The process of concentrating the grounds into a matrix starts with an arrangement where the agents make up the columns and the grounds the rows. The relational affinity between the grounds of the observations has been computed on the basis of the dependencies expressed through the agents' coincidences with different kinds of grounds. Their structuring is reported in Bierschenk & Bierschenk (1984b).

In the present study the rows and the columns have been interchanged in order to allow us the detection of the perspective structure of the grounds. The procedure chosen is the same as before. The affinity has been defined through the action component of the AaO model and has been computed through Ward's (1963) method. The computation has been executed with Wishart's (1982) CLUSTAN program. The amalgamations reported in Figures 1-4 minimize the loss of information, which is expressed as a minimum increase in the error sum of squares. At the empirical definition of a cluster two premises have been decisive: (1) There is an obvious break in the classification, or (2) the criterion value of .10 can be applied such that the resulting collinear clusters can be given a meaningful interpretation.

Practical. Six agents have been expressed in the texts of the practically concerned observers (Fig. 1). Their grouping based on expressed grounds has resulted in three clusters of which one

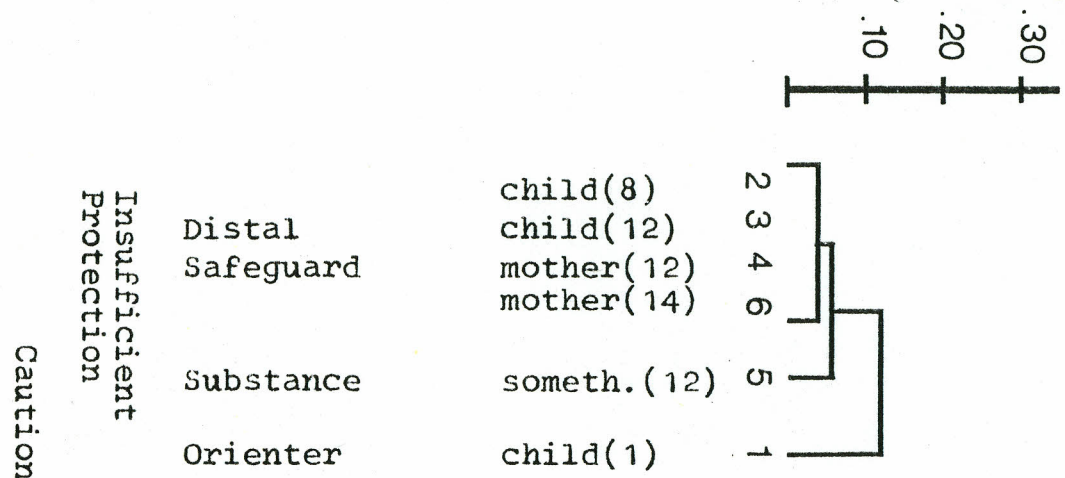


Figure 1. Practical: Perspective Structure of Grounds

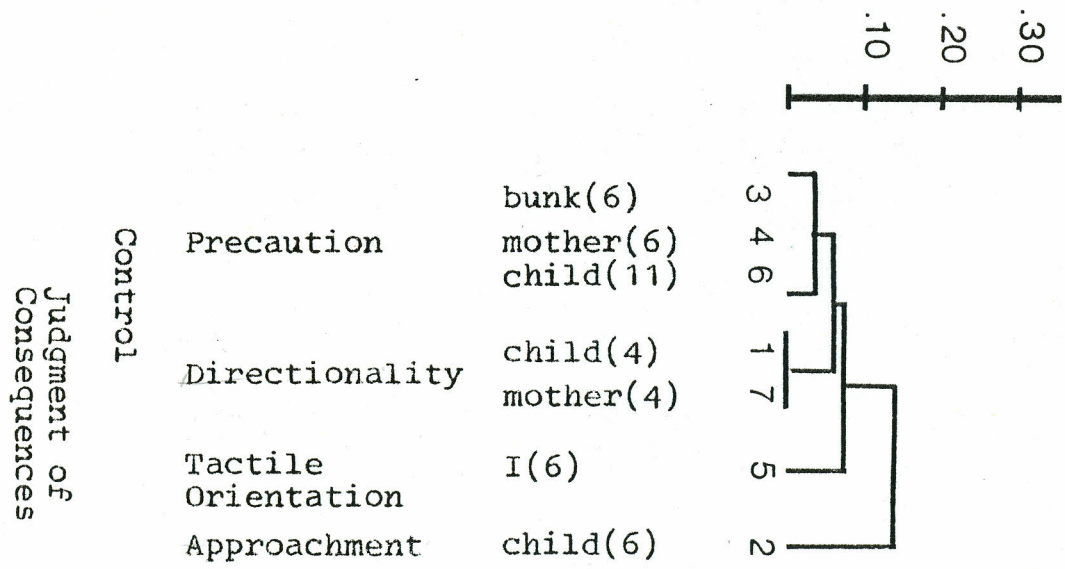


Figure 2. Aesthetic-Moral: Perspective Structure of Grounds

amalgamates most of the agents and is related to Distal Safeguard. This is closely related to one unique agent characterizing Substance. Together these two express an Insufficient Protection. The third cluster formed by a second unique agent, the Orienter, relates the entire structure to Caution.

Aesthetic-Moral. As can be seen in Figure 2, almost the same agents are expressed by aesthetic-morally endowed observers. But the four clusters formed show that they relate to a different perspective structure. In the first place, one agent pair relates to Directionality, which is closely connected with a cluster motivated by Precaution. One unique agent related to Tactile Orientation is linked to these groups and, finally, this structure is related to a perspective of Approachment. The overall perspective expresses a Re-orientation as a result of a Judgment of Consequences based on Control.

Social. The socially motivated observers express an agent structure which is primarily related to the Dangerous Place of the environment. Figure 3, namely, shows that two close groups have been clustered of which the first is based on Illusive Confidence and the second on the perceived Discontinuity in the texture. When the third cluster represented by a unique agent describing Directionality is combined with the dangerous place the entire ground supports the perception of Avoidance.

Technical-Physical. This environment has offered a variability of agents to subjects with a technical-physical background compared to the other interest groups. However, the three clusters (Fig. 4) are not as conceptually tight: Most of the variability is characterized by Attention and this is dependent upon a smaller cluster grouping the perceived Influencers behind it. The Orienter itself has not given much structure to the Power of Incitement, although it supports the overall Enforcement.

Discussion

The orienter is the link between grounds and reasons. The co-

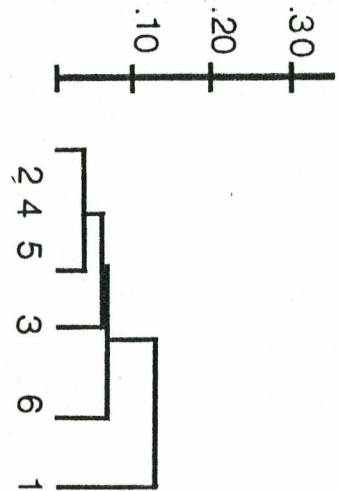


Figure 3. Social: Perspective Structure of Grounds

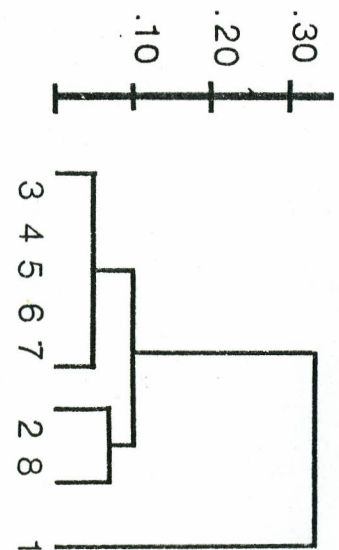
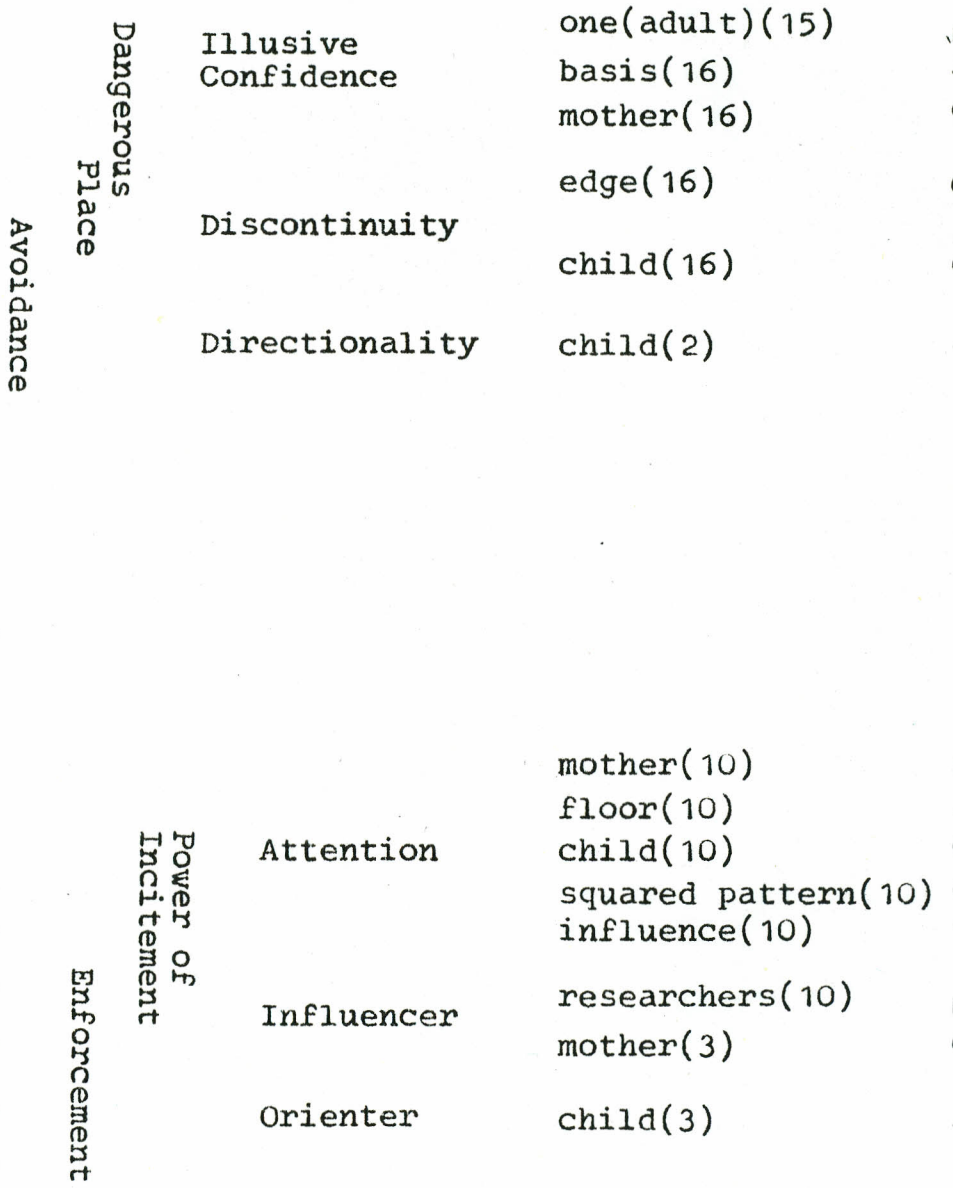


Figure 4. Technical-Physical: Perspective Structure of Grounds



operative structuring related to the grounds have demonstrated its overall function by Orienter, Approachment and Directionality being the final links to the overall conceptualizations.

The two dimensions of the Ground component has obviously been built into the environment and been perceived, since its primary structure is supported by the Substance or Discontinuity from one perspective and by the Directionality from others. For orientation, both are necessary, although the substantial properties are dependent in relation to the directional ones. As has been exemplified (5,6), this relationship may be expressed by overt linguistic keys. The cluster analysis shows that these dimensions underlie the perspective structure on the whole.

The reasons for synthesizing this environment in terms of Caution and Avoidance seems to be a perceptual binding to the dependent dimension of the grounds. A binding to the independent dimension, on the other hand, seems to provide reasons for re-orientation, which expresses a more elaborate conceptualization, since it is preceded by Judgment of Consequences and not by reaction only.

It has been demonstrated that observers with a technical-physical background tend to attend to details (Bierschenk & Bierschenk, 1984b) and to adapt their behaviour accordingly. It seems as if the reason for their perceptions is the forcefulness in the construction, which would also explain the loose link between the orienter and its environment. This group deviates from the other three in that the perspective expressed does not tell whether the structural component of the ground is present or not. Some hints may be given from the texts of the subjects nos. 3 and 10. These are their concluding observations of the deep side: "... and (the mother) seems to try to force the child to set out on the glass surface" (10), and "The child will crawl to the mother, despite that he will fall down into the hole" (3). It may be that observers with a technical-physical background are more bound to the real ground than to the illusive one.

References

- Becker, J.D. A model for the encoding of experiential information. In R.C. Schank & K.M. Colby (Eds.) Computer models of thought and language. San Francisco: Freeman, 1973. Pp. 396-434.
- Bierschenk, B. Steering mechanisms for knowability. Cognitive Science Research (Lund: Lund University), 1984, No. 1.
- Bierschenk, I. The schematism of natural language. Cognitive Science Research (Lund: Lund University), 1984, No. 2. (a)
- Bierschenk, I. Intended predication. Cognitive Science Research (Lund: Lund University), 1984, No. 5. (b)
- Bierschenk, B. & Bierschenk, I. A system for a computer-based content analysis of interview data. (Studia Psychologica et Paedagogica, 32) Lund: Gleerup, 1976.
- Bierschenk, B. & Bierschenk, I. The perspective structure in the verbal flow. Cognitive Science Research (Lund: Lund University), 1984, No. 4. (a)
- Bierschenk, B. & Bierschenk, I. Structural variations in verbally reported objectives. Cognitive Science Research (Lund: Lund University), 1984, No. 6. (b)
- Gibson, E.J. & Walk, R.D. The "Visual Cliff". Scientific American, 1960, 202, 64-71.
- Ward, J.H. Hierarchical grouping to optimize an objective function. Journal of the American Statistical Association, 1963, 58, 236-244.
- Wishart, D. Clustan: User manual. (Inter-University Research Council. Series 47) Edinburgh: Edinburgh University, Program Library Unit, April, 1982.

Acknowledgements

The research reported in this article was in part supported by a grant from the Fire and Life Insurance Ltd Scania Anniversary Fund. For substantial help we wish to thank especially the following persons: Helge Helmersson for his assistance in data processing, and the personnel at the Child Care Centres of Höllviksnäs and Vellinge for its support in the data collection phase.